Status Codes:
FE - Federally listed as Endangered under FESA
FT - Federally listed as Threatened under FESA
DEP - Depleted under the MMPA,
SS - Listed as a Strategic Stock
ST - State-listed as Threatened under California Endangered Species Act
PRO - Fully Protected Mammal under Fish and Game Code §4700
N/D - Insufficient data to calculate PBR
N/G- Incidental take not governed under the MMPA, FESA takes precedence in management of this species

7.2.3.1.4.4 Cetaceans

7.2.3.1.4.4.1 Humpback Whale

Humpback whales range from arctic waters south to California in the summer and can often be seen migrating along the California coast between April and November (Orr and Helm 1989). NMFS estimates that there are 905 humpback whales in the stock ranging from Mexico to Washington State (Forney et al. 2000). Humpback prey includes euphausiids, and small schooling fish like anchovies, cod, sardines, and mackerel (Wynne and Folkens 1992).

The shark-swordfish drift gill net fishery has been documented to interact with humpback whales in California (Forney et al. 2000). Additionally, in the past, two humpback deaths were attributed to entanglement in gill net fishing gear (Heyning and Lewis 1990), and a humpback whale was observed with a 20-ft section of netting wrapped around and trailing behind it (Forney et al 2000). In 1997, a humpback whale was snagged by a central California salmon troller and swam away with the hook trailing monofilament (Forney et al. 2000), but according to NMFS, this type of injury is not likely to be serious. Humpback whales are also killed by ship strikes.

7.2.3.1.4.4.2 Northern Right Whale

Northern right whales are considered rare in California although they have been sighted as far south as central Baja (Ferrero et al. 2000). It is thought that northern right whales calve in temperate coastal waters during the winter months and migrate to higher latitudes during the summer (Braham and Rice 1984). A current abundance estimate for right whales in California waters is unavailable. Right whales are zooplankton specialists feeding on small crustaceans including copepods and euphausiids (Wynne and Folkens 1992). There are no known fishery injuries or mortalities associated with this species in California waters.

7.2.3.1.4.4.3 Sperm Whale

Sperm whales are present in California offshore waters year-round (Dohl et al. 1983; Barlow 1995; Forney et al. 1995), reaching peak abundance from April through mid-June and from the end of August through mid-November (Rice 1974). Sperm whales are also known to occur inshore along submarine canyons, but typically prefer deepwater zones where they feed on giant squid

(80% of their diet), octopus, fish, shrimp, crab and small bottom sharks (Drumm and NMML 2000). Sperm whales are deep water divers; males have been known to dive to depths of 3,936 feet. Surveys conducted in 1991, 1993, and 1996, by Barlow (1997), estimated 1,191 sperm whales off the coast of California, Oregon and Washington.

NMFS has reported observed mortality and serious injury of sperm whales in the California shark-swordfish drift gill net fishery (Forney et al. 2000). There is also concern that the increasing anthropogenic noise in the ocean may negatively affect sperm whales.

7.2.3.1.4.4.4 Sei Whale

Sei whales are considered rare in California waters and do not appear to be associated with coastal features as they are an open ocean, temperate water species. (Forney et al. 2000). There was one confirmed sighting of a sei whale in California waters during NMFS' ship surveys in 1991-1993 and 1996, but there are no abundance estimates of sei whales along the West Coast. Sei whales feed on copepods, euphausiids, small fish and squid (Wynne and Folkens 1992).

The California shark-swordfish drift gill net fishery is the only fishery likely to interact with sei whales although no fishery mortalities or serious injurious have been observed (Forney et al. 2000). Ship strikes may occasionally kill sei whales although none have been documented thus far.

7.2.3.1.4.4.5 Fin Whale

Fin whales migrate from the summer feeding grounds in the Gulf of Alaska to winter calving grounds in the Gulf of California. Fin whales are fairly common year-round in southern and central California (Dohl et al. 1983, Forney et al. 1995). Barlow (1997) estimated 1,236 fin whales off the coasts of California, Oregon and Washington. Fin whales feed on invertebrates and small schooling fish (Wynne and Folkens 1992).

In 1999, NMFS reported the mortality of a fin whale in the California shark-swordfish offshore drift gill net fishery (NMFS observer data).

7.2.3.1.4.4.6 Blue Whale

Similar to fin whales, blue whales range from the Gulf of Alaska to tropical waters and can often be seen in southern California in June through September (Forney et al. 2000). Blue whales eat euphausiids and copepods (Drumm and NMML 2000). NMFS estimates that there are 1,940 blue whales in California (Forney et al. 2000).

The only fishery likely to interact with blue whales is the California shark-swordfish drift gill net fishery although no fishery mortalities or serious injurious have been observed (Forney et al. 2000). Ship strikes have been documented to kill blue whales.

7.2.3.1.4.4.7 Gray Whale

Gray whales range from the Baja Peninsula in Mexico to the Gulf of Alaska and can be observed off the coast of California during their southerly migration during late fall to early winter, and on their northerly migration between February and April. Abundance estimates from a census conducted in 1997/98 yielded 26,635 animals (Forney et al. 2000). Gray whales usually occur from 3 to 12 miles offshore but can be found within a few hundred yards from shore and are frequently observed in kelp beds. Gray whales are the only benthic feeding whale and feed by swimming slowly along the seafloor sucking sediment and prey (Wynne and Folkens 1992). Gray whales do not usually feed during migration (Swartz 1986).

In California, there have been several gray whale mortalities and injuries associated with gill net gear including one death reported in 1998 from the California shark-swordfish drift gill net fishery as well as reports of animals found swimming, floating or stranded with gill net gear attached to their bodies in 1996 and 1997. During the same time there have been several reports of gray whales entangled in crab pot gear resulting in one death, one released alive, and one release with unknown injuries (Ferrero et al. 2000). Gray whales are particularly vulnerable to ship strikes because of their nearshore migration routes (Forney et al. 2000).

7.2.3.1.4.4.8 Harbor Porpoise

Harbor porpoise are found in coastal and inland waters from Point Conception, California, to Alaska. Harbor porpoise along the West Coast are not migratory and do not move extensively between California, Oregon and Washington (Calambokidis and Barlow 1991). Harbor porpoise in Washington and British Columbia are known to feed on schooling fish and invertebrates including Pacific herring, mackerel, smelt, eelpout, and eulachon (Gearin et al. 1994, Wynne and Folkens 1992). Based on aerial surveys, it is estimated that there are approximately 5,700 harbor porpoise in central California (Forney 1999).

The harbor porpoise stock in central California is considered strategic, owing to increased mortality in the large mesh (>3.5 inches) set gill net fishery. The entanglement of harbor porpoise in the set gill net fishery has increased since the early 1990's. During 1996 through 1998, it is estimated that 63 harbor porpoise were incidentally killed in the fishery, the average annual mortality exceeding the PBR. Mortality estimates for the months of January through September 1999 show that 123 harbor porpoise were killed in the fishery (Forney et al. 2000).

The Department is currently working on regulations to limit all set gill and trammel net fishing from Pt. Reyes to Pt. Arguello to 60 fathoms or greater. Thus, set gill net associated mortalities are likely to decrease. Additionally, there are efforts underway to encourage the voluntary use of "pingers," which have proven successful in reducing harbor porpoise mortalities on the East Coast. Harbor porpoise are not found in southern California and they are not subject to gill net mortality in northern California as there is no set gill net activity in northern California. Aside from set gill nets, there are no other known fishery-related injuries or mortalities of harbor porpoise.

7.2.3.1.4.4.9 Risso's Dolphin

Risso's dolphins are distributed world-wide in temperate waters and are commonly seen off the West Coast on the shelf in the Southern California Bight and in slope and offshore waters (Forney et al. 2000). It is estimated that there are approximately 16,400 Risso's dolphins in California, Oregon and Washington. Risso's dolphins consume squid and small fish.

There is documented mortality of unknown extent for Risso's dolphins in the squid purse seine fishery off southern California (Heyning et al. 1994). This mortality is likely intentional rather than incidental with fishermen killing the animals to protect gear and catch. With the 1994 amendments to the MMPA, intentional takes are now illegal. There is also documented mortality of Risso's dolphins in the shark-swordfish drift gill net fishery.

7.2.3.1.4.4.10 Short-finned Pilot Whale

Short-finned pilot whales were commonly seen off California up until the 1982-83 El Niño event. Since that time, sightings have been rare despite increased survey efforts (Forney et al. 2000). NMFS estimates the California, Oregon and Washington population of pilot whales at 970 animals. Short-finned pilot whales consume squid and small fish.

There is documented mortality of short-finned pilot whales in the shark-swordfish drift gill net fishery. Historically, short-finned pilot whales were also killed in squid purse seine operations (Miller et al. 1983; Heyning et al. 1994). This mortality is likely intentional rather than incidental with fishermen killing the animals to protect gear and catch. With the 1994 amendments to the MMPA intentional takes are now illegal. At the present time, the squid fishery does not have observers for marine mammal mortality despite the fact that it has expanded markedly since 1992. No recent mortality of short-finned pilot whales has been reported, presumably because short-finned pilot whales are no longer common in the areas utilized by the squid fishery.

7.2.3.1.4.4.11 Bottlenose Dolphin

Bottlenose dolphins are distributed worldwide in tropical and temperate waters. In California, NMFS separates bottlenose dolphins into two separate stocks, offshore and coastal, based on distribution. NMFS estimates that there are approximately 950 offshore bottlenose dolphins in California, Oregon and Washington, and 169 coastal dolphins in California waters (Barlow 1997). Offshore bottlenose dolphins consume predominantly squid, while coastal bottlenose dolphins eat a variety of fish, squid, and crustaceans (Drumm and NMML 2000).

Offshore bottlenose dolphins are often associated with Risso's dolphins and short-finned pilot whales; they may also experience some mortality in the squid fishery (Heyning et al. 1994). However, according to NMFS, these mortalities probably represent animals that were intentionally killed to protect catch or gear, rather than incidental kills. These takes are now illegal under the 1994 amendment to the MMPA. Because of their selective use of the coastal habitat, coastal bottlenose dolphins may be susceptible to fishery related injury and mortality, although none has been documented to date. In southern California, coastal bottlenose dolphins have been found to have high levels of pollutants in their system.

7.2.3.1.4.4.12 Pacific White-sided Dolphin

Pacific white-sided dolphins are primarily found in shelf and slope waters off the West Coast. It is estimated that there are approximately 25,000 animals in California, Oregon and Washington. Pacific white-sided dolphins feed on a variety of small schooling fish and squid (Wynne and Folkens 1992).

There is documented mortality and injury in the shark-swordfish drift gill net fishery and the domestic groundfish trawl fishery.

7.2.3.1.4.4.13 Dall's Porpoise

Dall's porpoise are found in temperate waters and are commonly seen in shelf, slope and offshore waters in California. The population for California, Oregon and Washington is estimated at 117,500 animals (Forney et al. 2000). Dall's porpoise feed on a variety of fish and squid (Wynne and Folkens 1992).

There is documented mortality and injury in the shark-swordfish drift gill net fishery and the domestic groundfish trawl fishery.

7.2.3.1.4.5 Pinnipeds

7.2.3.1.4.5.1 Steller (Northern) Sea Lion

Steller sea lions, also known as northern sea lions, occur throughout the North Pacific ranging from northern Japan to California (Loughlin et al. 1984). The

eastern stock of Steller sea lions (which includes those found in California waters) is listed as federally threatened while the western stock (Alaska) population is listed as endangered. In southern and central California, Steller sea lion numbers have declined while in northern California they are stable. During 1996, NMFS counted 6,555 animals in California (Forney et al. 2000). Small breeding rookeries can be found at Año Nuevo Island, Southeast Farallon Island, and at Cape St. George (Reeves et al. 1992). Steller sea lions are considered opportunistic and consume a variety of fish, squid, octopus, crabs, and shrimp.

Steller sea lions have been incidentally taken in the California shark-swordfish drift gill net fishery, as well as in groundfish trawl fisheries.

7.2.3.1.4.5.2 Northern Fur Seal

Northern fur seals occur from throughout the North Pacific ranging from Japan to southern California (Ferrero et al. 2000). Only the eastern Pacific stock (Alaska) of northern fur seals is considered depleted under the MMPA. The primary rookeries are found in the Bering Sea, although there is a small breeding colony on San Miguel Island (approximately 4,000 animals) that represents less than one percent of the population. In 1999, the most recent estimate for the San Miguel stock was approximately 4,300 animals (Forney et al. 2000). Northern fur seals feed primarily at night on pelagic schooling fish and squid (Wynne and Folkens 1992).

There have been no reports of mortality in any observed fishery along the West Coast since 1994 (Forney et al. 2000).

7.2.3.1.4.5.3 Guadalupe Fur Seal

Guadalupe fur seals breed along the western coast of Guadalupe Island, west of Baja California, Mexico, although individuals have been seen around the Channel Islands and central California. Commercial sealing during the 19th century reduced this once abundant seal population to near extinction in the late 1800's (Townsend 1931). Before sealing, Guadalupe fur seals ranged as far north as from Point Conception and possibly the Farallon Islands (Fleischer 1987). Guadalupe fur seals feed on fish and squid.

Drift and set gill net fisheries may cause incidental mortality of Guadalupe fur seals although no fishery mortalities or serious injurious have been observed (Forney et al. 2000). Additionally, strandings data show that Guadalupe fur seals interact with hook and line fisheries as animals have been found in central and northern California with fish hooks, monofilament line, and polyfilament string (Hanni et al. 1997).

7.2.3.1.4.5.4 Northern Elephant Seal

Northern elephant seals breed on offshore islands in California and Baja California, Mexico, from December to March (Stewart et al. 1994), and range along the coasts up to Alaska in the non-breeding season. The population has increased exponentially in the past century (Reeves et al. 1992), and in 1996 the California stock was estimated to be 84,000 animals (Forney et al. 2000). Northern elephant seals feed on deepwater fish, squid, and octopus.

Northern elephant seals have been incidentally taken in the California shark-swordfish gill net fishery and the large mesh set gill net fishery (>3.5 inches). Northern elephant seals may also interact with hook and line fisheries as stranding data reported to the California Marine Mammal Stranding Network in 1995-98 included two injuries attributed to hook and line gear (Forney et al. 2000). California strandings data from 1995 to 1998 attributed one boat collision injury, five deaths from car collisions at Piedras Blancas (recent measures have been taken to prevent further car collision deaths), and three deaths from shootings (Forney et al. 2000). It should be noted that 1994 amendments to the MMPA made intentional lethal take of any marine mammal illegal except where imminently necessary to protect human life. The total human-caused mortality and serious injury (fishery related plus other sources) for this stock is less than their PBR (Forney et al. 2000).

7.2.3.1.4.5.5 Pacific Harbor Seal

Pacific harbor seals range in the north east Pacific from central Baja California, Mexico, to Alaska. In California, they are one of the more commonly observed pinnipeds, hauling out on rocks, reefs, mud flats, and beaches where they are subject to disturbance and harassment by humans. Pacific harbor seals pup along the coast of California and on offshore islands from February through June. Harbor seals are considered opportunistic feeders and consume a variety of fish, squid, and crustaceans. The population of Pacific harbor seals in California is estimated to be at least 30,000 animals based on 1995 estimates (Forney et al. 2000).

The vast majority of Pacific harbor seal mortality in California fisheries occurs in the large mesh set gill net fishery. Additionally, Pacific harbor seals are killed and/or injured in the purse seine fisheries for squid, anchovy, mackerel, and tuna and groundfish trawl fisheries. Stranding data have shown that additional mortality and injuries are caused by hook-and-line fisheries (fishing line as well as fishing hooks). Pacific harbor seals are known to interact with other fishing operations including; salmon troll and commercial passenger fishing vessel (CPFV) fishery where they follow the vessels to feed on bait used to chum for sportfish, and to depredate hooked fish (Miller et al. 1983). Although now illegal, mortality associated with these fisheries is likely intentional with fishermen killing the animals to protect gear and catch. California strandings data for 1995 to 1998 showed additional mortality of Pacific harbor seals with 20 deaths from

entrainment in power plants, 10 deaths and two injuries from boat collisions, nine deaths from shootings (Forney et al. 2000). The total fishery mortality and serious injury for this stock is less than their PBR (Forney et al. 2000).

7.2.3.1.4.5.6 California Sea Lion

The California sea lion is the most commonly recognized and most abundant pinniped in California. California sea lions are a migratory species that range from southern Mexico to Canada. They breed during July primarily at the Channel Islands in southern California, although some breeding occurs at Año Nuevo Island and the Farallon Islands. After the breeding season, adult and sub-adult males migrate north, although some remain at haul-out sites in central and northern California then return south in March to May. Movements of females are unknown. Recent 1999 population estimates, based on pup counts with a multiplication factor, ranged from 204,000 to 214,000 animals (Forney et al. 2000). The California sea lion is considered an opportunistic feeder and eats schooling fish, squid, flatfish, salmon, and lamprey.

California sea lions are incidentally killed in the set and drift gill net fisheries. It is estimated that 1,228 sea lions were killed in the large mesh (>3.5 inches) set gill net fishery in 1998. Mortality also occurs in the salmon troll, and round haul fisheries for herring, anchovy, mackerel, sardine, tuna, squid, and the CPFV fishery (Miller et al. 1983, NMFS 1995). Although illegal, the mortality associated with these fisheries is likely intentional with fishermen killing the animals to protect gear and catch. California sea lions also interact in trap fisheries including lobster, crab, and live-fish traps where they depredate the traps and damage or destroy them. California sea lions are the primary species involved with the CPFV fishery (Miller et al. 1983) and they are occasionally hooked when they depredate catches. Additionally, California sea lions are entangled in fishing gear and debris. Strandings data for 1998 (California, Oregon and Washington) showed three mortalities from boat collisions, 30 deaths from entrainment in power plants, and 70 deaths and eight injuries from shootings (Forney et al. 2000). Algal blooms along the coast resulting in the production of domoic acid have been responsible for additional California sea lion deaths**.** The total human-caused mortality and serious injury (fishery related plus other sources) for the California sea lion stock is less than their PBR (Forney et al. 2000).

7.2.3.1.4.6 Southern Sea Otter

Southern sea otters range along the California mainland coast from Point Año Nuevo to Purisima Point and a colony exists on San Nicholas Island (Forney et al. 2000). They breed and give birth year-round in California. A spring 2000 survey revealed 2,317 animals counted along the mainland with additional animals at San Nicholas Island (USFWS 2000). Southern sea otters feed almost exclusively on marine invertebrates including clams, mussels, chitons, barnacles,

starfish, abalone, urchins, crabs, octopus and squid (Miller 1974). Fishery associated mortality includes drowning in set gill nets, lobster traps, and one individual was discovered drowned in a crab pot off Pt. Santa Cruz (Forney et al. 2000).

Southern sea otters are killed in the large mesh set gill nets (>3.5 inches). The Department is currently working on regulations to limit all set gill and trammel net fishing from Pt. Reyes to Pt. Arguello to 60 fathoms or greater. Thus, gill net associated mortalities are likely to decrease.

Southern sea otters have been found dead with wounds caused by boat propellers and 11 out of 1,680 carcasses, collected from 1968 to 1989, were known to have drowned as a result of becoming entangled in fishing lines. Southern sea otters are primarily found in water depths less than about 30 meters (100 feet).

7.2.3.1.4.7 Environmental Consequences of Proposed Actions

7.2.3.1.4.7.1 "No Project or Status Quo" (Current Regulations)

Consistent with the Marine Life Management Act, management authority for the market squid fishery has been delegated to the Fish and Game Commission, as it has demonstrated an ability to respond quickly to real-time needs and changes in the fishery during the interim period. Current regulations include weekend closures to allow for uninterrupted spawning in areas where squid are present. This measure spreads the escapement out throughout the year, rather than concentrating it at the beginning or end (unlike a seasonal quota or seasonal closure). Current management measures also include a seasonal statewide catch limitation (landings cap) which is intended to prevent expansion in the volume of the current fishery. There is also a research and monitoring program which assists in management of the squid fishery to achieve sustainability. Additionally, the squid harvest is monitored through an egg escapement model at 30%. Current regulations also include gear restrictions (maximum wattage on squid lights and shields), and a requirement for market vessels and light boats to maintain and submit logbooks.

7.2.3.1.4.7.2 Direct Effects of the "No Project or Status Quo" on Cetaceans

There are no reports of squid purse seine fishery-related mortality or serious injury in any of the baleen (Suborder Mysticeti) whale stocks including; Humpback whale, Northern right whale, Sei whale, Fin whale, Blue whale, Gray whale, Bryde's whale and Minke whales, in California waters. Subsequently, there are no reports of squid purse seine fishery-related mortality or serious injury in the majority of the toothed (Odontocetes) whales stocks including; sperm whale, pygmy sperm whale, killer whale, Cuvier's beaked whale, Baird's beaked whale, harbor porpoise, Dall's porpoise, northern right whale dolphin, long-

beaked common dolphin, short-beaked common dolphin, coastal bottlenose dolphin, striped dolphin, and Pacific white-sided dolphin, in California waters. The exceptions are in the Delphinidae family, where reports of squid purse seine fishery-related mortality or serious injury are noted for the short-finned pilot whale, Risso's dolphin, and the offshore bottlenose dolphin.

Although there are historical accounts of serious injury and mortality interactions between the squid purse seine fishery and short-finned pilot whales, sightings of pilot whales have been rare since the 1982-83 El Niño event (Forney et al. 2000). Past mortalities probably represented animals that were intentionally killed to protect catch or gear, rather than incidental kills. These takes are now illegal under the 1994 Amendment to the MMPA. There are no recent reports of short-finned pilot whale mortalities associated with this fishery, most likely because short-finned pilot whales are no longer common in the areas utilized by the squid purse seine fishery and because the fishery is not monitored at sea. However, there have been anecdotal reports of pilot whale sightings near squid fishing operations during the 1997-98 fishing season. Additionally, the squid purse seine fishery is listed as Category II under NMFS classification, with the short-finned pilot whale listed as the marine mammal species/stock incidentally injured or killed. Thus, based on historical accounts of mortality and the fact that the squid purse seine fishery is listed as a Category II fishery, we cannot rule out the possibility that the squid purse seine fishery may interact with short-finned pilot whales in the future.

There is documented mortality for Risso's dolphins in the squid purse seine fishery off southern California (Heyning et al. 1994), and because offshore bottlenose dolphins are often associated with Risso's dolphins and short-finned pilot whales, they too may experience some serious injury or mortality in the squid purse seine fishery (Heyning et al. 1994). However, as mentioned above, the fishery is not monitored at sea so recent mortality of these species has not been reported. Additionally, according to NMFS (Forney et al. 2000), these mortalities probably represented animals that were intentionally killed to protect catch or gear, rather than incidental kills, and these takes are now illegal under the 1994 amendment to the MMPA. This, based on historical accounts, we cannot rule out the possibility that the squid purse seine fishery may interact with Risso's dolphins and offshore bottlenose dolphins.

7.2.3.1.4.7.3 Indirect Effects of the "No Project or Status Quo" on Cetaceans

Market squid are eaten by a number of cetaceans. Their importance in the cetacean diet varies among species. Although there is information about which prey species are consumed by cetaceans, it is not possible to estimate the total amount of market squid consumed by cetaceans in California waters. Thus, it is not possible to determine the allocation of market squid necessary to sustain cetacean populations and, consequently, makes analysis difficult of whether

market squid fishery management practices are having a potentially adverse impact on cetaceans. However, it should be noted that goal of squid fishery management is to maintain a long-term economically viable fishery that matches the level of effort to the health of the resource. Current management regulations include a two-day weekend closures and a seasonal statewide limit on catch, which are precautionary management. In the absence of conclusive biological information upon which to base a quota or other management approach, a two-day per week time period allows for uninterrupted spawning in areas where squid are present. Unlike a seasonal quota or seasonal closure, this measure spreads the escapement out throughout the year, rather than concentrating it at the beginning or end. Current interim management measures also include a seasonal statewide catch limitation (landings cap) which limits landings to a maximum seasonal catch, a research and monitoring program which assists in management of the squid fishery to achieve sustainability, and monitoring of the squid harvest through an egg escapement model at 30%.

7.2.3.1.4.7.4 Direct Effects of the "No Project or Status Quo" on Pinnipeds and Sea Otters

There are no reports of squid purse seine fishery-related mortality or serious injury in the northern elephant seal, Guadalupe fur seal, northern fur seal, Steller sea lion, or southern sea otter stocks in California waters. There are, however, documented interactions of serious injury and mortality of California sea lions in the squid purse seine fishery. Nevertheless, the total fishery mortality and serious injury for the California sea lion stock is less than the PBR of 6,591 (Forney et al. 2000) (fishery mortality= 1,208, other sources of mortality =144), and the majority of interactions occur in the gill net fishery rather than the squid purse seine fishery. There are also documented interactions of serious injury and mortality of Pacific harbor seals in the squid purse seine fishery. Again, the total fishery mortality and serious injury for Pacific harbor seal stock is less than the PBR of 1,678 (Forney et al. 2000) and the majority of interactions occurs in other fisheries (e.g., set gill net) rather than the squid fishery.

7.2.3.1.4.7.5 Indirect Effects of the "No Project or Status Quo" on Pinnipeds and Sea Otters

Market squid are eaten by a number of pinniped species as well as southern sea otters. Their importance in the pinniped and otter diet varies among species. Although there is information about which prey species are consumed by pinnipeds and otters, it is not possible to estimate the total amount of market squid consumed by pinnipeds and otters in California waters. Thus, it is not possible to determine the allocation of market squid necessary to sustain pinniped and sea otter populations and consequently, makes analysis of whether market squid fishery management practices are having a potentially adverse impact on these species difficult. However, it should be noted that the goal of squid fishery management is to maintain a long-term economically viable fishery

that matches the level of effort to the health of the resource. Current management regulations include a two-day weekend closures which is precautionary management. In the absence of conclusive biological information upon which to base a quota or other management approach, a two-day per week time period allows for uninterrupted spawning in areas where squid are present. Unlike a seasonal quota or seasonal closure, this measure spreads the escapement out throughout the year, rather than concentrating it at the beginning or end. Current interim management measures also include a seasonal statewide catch limitation (landings cap) which limits landings to a maximum seasonal catch, a research and monitoring program which assists in management of the squid fishery to achieve sustainability, and monitoring of the squid harvest through an egg escapement model at 30%.

7.2.3.1.4.8 Significance Criteria for Pinnipeds and Cetaceans for the Proposed Management Options

The effects of fishery management decisions on marine mammal populations are typically considered in the context of direct and indirect effects. Direct effects are those where a marine mammal is incidentally taken, seriously injured, or disturbed, while indirect effects are those where the marine mammal's prey abundance and availability is negatively affected. Because NMFS' PBR calculation includes a reduction to account for indirect effects that may have caused the stock to be reduced below its OSP (K. Forney personal communication, Barlow et al. 1995), such as adverse impacts on behavior, reproduction, survival, loss of habitat, prey abundance and availability, or a change in spatial distribution and/or abundance, we need only consider direct effects for significance criteria. Effects are categorized as significant, adverse but not significant, or insignificant.

Impacts from the proposed project are considered significant when:

- Incidental mortality or serious injury on a marine mammal stock results in the removal of a number of individuals, and when combined with all other known incidental mortality or serious injury, the value is greater than the PBR level calculated under the MMPA.

Impacts from the proposed project are considered adverse but not significant when:

- Incidental mortality or serious injury cause individuals from a marine mammal stock to be removed, but the level of take is below the PBR when combined with all other known incidental mortalities and/or serious injuries.

Impacts from the proposed project are considered insignificant when:

- There is no incidental mortality or serious injury

7.2.3.1.4.9 Significance criteria for the Southern Sea Otter

The incidental take of sea otters is not governed under the MMPA, thus, significance criteria based on PBR is impractical. Southern sea otters are federally listed as endangered and depleted under MMPA; their management is under the charge of the USFWS rather than NMFS. At the current time there is no authorized incidental take of the southern sea otter, thus, we have based our significance criteria on the following:

Impacts from the proposed project are considered significant when:

- A southern sea otter is incidentally taken or seriously injured, or its essential behavioral patterns including breeding, feeding, or sheltering are impaired to such a degree that the sea otter is killed or seriously injured constituting a take.

Impacts from the proposed project are considered adverse but not significant when:

- A southern sea otter is disturbed but not to a degree that would constitute a take.

Impacts from the proposed project are considered insignificant when:

- There is no interaction.

7.2.3.1.4.10 Alternatives (Management Measures)

There is an assortment of management measures that can be used to achieve the goals of the MSFMP. These include limited entry, catch limitations, time and area closures, harvest replenishment areas, commercial gear restrictions, permit fees, monitoring programs, vessel identification, bycatch, prohibited species and size, and coordination with the Federal CPSFMP. The impact of each alternative on marine mammals is discussed below.

7.2.3.1.4.10.1 Limited Entry Alternative

The limited entry alternative is a restricted access program that would serve to prevent expansion of the fishery in terms of the number of vessels and their capacity. Three major components make up the program, a fleet capacity goal, initial issuance criteria, and guidelines for permit transferability.

Implementation of this alternative would reduce the number of squid vessels and light boats. However, the vessels slated for inclusion in the limited entry program represent the majority (94%) of the current landings trips, so although there could

be a slight (6%) reduction in the number of fishing trips, it is likely that the remaining vessels would continue to fill the seasonal statewide catch limitation or landings cap. Accordingly, total fishing effort would be equal to or less than the "no project" alternative. The number of brail vessels may increase, but the brail squid fishery is considered a Category III fishery (those with a remote likelihood of marine mammal interaction or no known serious injuries or mortalities with marine mammals) and there is no evidence that marine mammals interact with brail squid vessels. Additionally, the design of the permit transfer system does not allow for increases in the harvesting capability of the fleet.

Given the past absence of squid purse seine fishery interactions, serious injury or mortality, with baleen whale stocks and the majority of the toothed whales, we assume that implementation of the limited entry alternative would have an insignificant (no incidental mortality or serious injury) effect on these species. However, there are documented incidents of squid purse seine fishery interactions with short-finned pilot whales, Risso's dolphins, and offshore bottlenose dolphins, thus there is the potential for these species to interact with the squid fishery. However, since short-finned pilot whales are no longer common in the areas utilized by the squid purse seine fishery, and there are no recent accounts of interactions with Risso's dolphins or offshore bottlenose dolphins, we conclude that the effects of implementing the limited entry alternative is likely to have an adverse (incidental mortality or serious injury causes individuals to be removed from a marine mammal stock, but the level of take is below the PBR) but not significant effect on short-finned pilot whales, Risso's dolphins, and offshore bottlenose dolphins.

There are no reports of squid purse seine fishery interactions, serious injury or mortality, with the northern elephant seal, Guadalupe fur seal, northern fur seal, or Steller sea lion stocks, and no reports of squid purse seine interactions with the southern sea otter. Thus, we assume that implementation of the limited entry alternative would have an insignificant (no incidental mortality or serious injury for pinnipeds, and no interaction for sea otters) effect on these species. However, there are documented squid purse seine fishery interactions, of serious injury and mortality, with California sea lion and Pacific harbor seal stocks. But, the total fishery mortality and serious injury for the California sea lion stock is less than the PBR of 6,591 (Forney et al. 2000) (fishery mortality = 1,208, other sources of mortality = 144), and the majority of interactions occur in the gill net fishery rather than the squid purse seine fishery. Comparably, the total fishery mortality and serious injury for the Pacific harbor seal stock is less than the PBR of 1,678 (Forney et al. 2000) and the majority of interactions occurs in other fisheries (e.g. set gill net) rather than the squid fishery. Thus, we conclude that the effects of implementing the Limited Entry Management Alternative is likely to have an adverse (incidental mortality or serious injury causes individuals to be removed from a marine mammal stock, but the level of take is below the PBR) but not significant effect on California sea lion and Pacific harbor seal stocks.

7.2.3.1.4.10.2 Catch Limitations Alternative

The catch limitations alternative serves to prevent expansion in the volume of the current fishery should market demand encourage such expansion. Currently, the catch limitation (or landings cap) is the status quo or "no project" alternative of 125,000 tons (based on the highest seasonal landings recorded). Other options under this alternative include a catch limit range of 11,000 tons in El Niño years to 115,000 tons in non-El Niño years, a range of 73,900 to 106,400 tons, and a no seasonal landing limit which would allow for unlimited increases in annual landings of squid.

The effects of implementing this alternative depend on which option is selected. Maintaining the status quo of 125,000 tons is not likely to increase the total fishing effort beyond that in the "no project" alternative, whereas a no seasonal landing limit could result in increased fishing effort which could increase the potential for marine mammal interactions. Reducing landings during an El Niño year is likely to decrease fishing effort and lower potential for marine mammal interactions. Additionally, during El Niño years the availability and abundance of squid are typically less than in non-El Niño years, thus, lowered landings would benefit those marine mammals who consume squid as more squid would be available for their consumption.

Given the past absence of squid purse seine fishery interactions, serious injury or mortality, with baleen whale stocks and the majority of the toothed whales, we assume that implementation of the catch limitations alternative options would have an insignificant (no incidental mortality or serious injury) effect on these species. However, there are documented incidents of squid purse seine fishery interactions with short-finned pilot whales, Risso's dolphins, and offshore bottlenose dolphins, thus there is the potential for these species to interact with the squid fishery. However, since short-finned pilot whales are no longer common in the areas utilized by the squid purse seine fishery, and there are no recent accounts of interactions with Risso's dolphins or offshore bottlenose dolphins, we conclude that the effects of implementing the catch limitations alternative option where the landings limit would be equal to or less than the current status quo is likely to have an adverse (incidental mortality or serious injury causes individuals to be removed from a marine mammal stock, but the level of take is below the PBR) but not significant effect on short-finned pilot whales, Risso's dolphins, and offshore bottlenose dolphins. Conversely, we conclude that the effects of implementing the catch limitations alternative option where landings would be unlimited and fishing effort could increase has the potential to have a significant (incidental mortality or serious injury on a marine mammal stock results in the removal of a number of individuals that is greater than the PBR) effect on short-finned pilot whales and offshore bottlenose dolphins (PBRs of 5.7 and 8.5, respectively), and an adverse but not significant effect on Risso's dolphins (PBR=105).

There are no reports of squid purse seine fishery interactions, serious injury or mortality, with the northern elephant seal, Guadalupe fur seal, northern fur seal, or Steller sea lion stocks, and no reports of squid purse seine interactions with the southern sea otter. Thus, we assume that implementation of the catch limitations alternative would have an insignificant (no incidental mortality or serious injury for pinnipeds, and no interaction for sea otters) effect on these species. However, there are documented squid purse seine fishery interactions, of serious injury and mortality, with California sea lion and Pacific harbor seal stocks. But, the total fishery mortality and serious injury for the California sea lion stock is less than the PBR of 6,591 (Forney et al. 2000) (fishery mortality = 1,208, other sources of mortality = 144), and the majority of interactions occur in the gill net fishery rather than the squid purse seine fishery. Comparably, the total fishery mortality and serious injury for the Pacific harbor seal stock is less than the PBR of 1,678 (Forney et al. 2000) and the majority of interactions occurs in other fisheries (e.g., set gill net) rather than the squid fishery. Thus, we conclude that the effects of implementing the catch limitations alternative (no matter which option) is likely to have an adverse (incidental mortality or serious injury causes individuals to be removed from a marine mammal stock, but the level of take is below the PBR) but not significant effect on California sea lion and Pacific harbor seal stocks.

7.2.3.1.4.10.3 Time (Season)/Area Closure Alternative

Time (season, days of the week, or time of day) and area closures may include closed times or areas for the entire fishery, regions of the coast, specific user groups or individuals. Time closures may be implemented to protect spawning individuals when they are most vulnerable. Current regulations ("no project" alternative) prohibit the take of market squid for commercial purposes each week between noon Friday to noon Sunday from the U.S.-Mexico border to the California-Oregon border (weekend closure). The regulation affects vessels catching squid and vessels using lights to attract squid and does not apply to vessel pursuing squid for live bait purposes. This precautionary measure was adopted to provide spawning squid at least two nights reprieve from fishing pressure. However, in addition to proposing additional time and area closures, this alternative also includes the option to remove the existing weekend closure.

Implementation of additional time and area closures is not likely to increase total fishing effort beyond that in the "no project" alternative. There would be no marine mammal interaction during closed times and in closed areas, but exclusion of squid fishing in closed areas could shift fishing effort to areas with higher marine mammal populations (e.g., adjacent to pinniped rookeries, haul out sites, foraging areas). This could result in a higher rate of squid fishery interaction with marine mammals. However, this scenario can be avoided by ensuring that closed areas encompass important marine mammal foraging, breeding, and haul-out sites. A potential benefit to marine mammals may occur

from an increased productivity of prey species available to marine mammals in the closed areas.

Implementation of the removal of weekend closures could increase the number of marine mammal interactions above the current level during the weekends. However, on an annual basis, overall fishing effort is likely to be the same as in the "no project" alternative given the current landings cap. Removal of weekend closures could negatively impact marine mammals in terms of available forage. The two-day per week no-fishing time period allows for uninterrupted spawning in areas where squid are present. Unlike a seasonal quota or seasonal closure, this measure spreads the escapement out throughout the year, rather than concentrating it at the beginning or end. Additional fishing pressure on the market squid resource could potentially reduce the numbers of market squid available to marine mammals. Although there is information available on which prey species are consumed by marine mammals, it is not possible to estimate the total amount of market squid consumed by marine mammals in California waters. Thus, it is not possible to determine the allocation of market squid necessary to sustain marine mammal populations and consequently, makes analysis of whether eliminating the two-day per week no fishing time period would have a potentially adverse impact on marine mammals difficult. However, NMFS' PBR calculation includes a reduction to account for indirect effects, including prey abundance and availability. Additionally, it should be remembered that the goal of squid fishery management is to maintain a long-term economically viable fishery that matches the level of effort to the health of the resource.

Given the past absence of squid purse seine fishery interactions, serious injury or mortality, with baleen whale stocks and the majority of the toothed whales, we assume that implementation of the time (season)/area closure alternative would have an insignificant (no incidental mortality or serious injury) effect on these species. However, there are documented incidents of squid purse seine fishery interactions for short-finned pilot whales, Risso's dolphins, and offshore bottlenose dolphins, thus there is the potential for these species to interact with the squid fishery. However, since short-finned pilot whales are no longer common in the areas utilized by the squid purse seine fishery, and there are no recent accounts of interactions with Risso's dolphins or offshore bottlenose dolphins, we conclude that the effects of implementing the time (season)/area closure alternative is likely to have an adverse (incidental mortality or serious injury causes individuals to be removed from a marine mammal stock, but the level of take is below the PBR), but not significant effect on short-finned pilot whales, Risso's dolphins, and offshore bottlenose dolphins.

There are no reports of squid purse seine fishery interactions, serious injury or mortality, with the northern elephant seal, Guadalupe fur seal, northern fur seal, or Steller sea lion stocks, and no reports of squid purse seine interactions with the southern sea otter. Thus, we assume that implementation of the

time(season)/area closure alternative would have an insignificant (no incidental mortality or serious injury for pinnipeds, and no interaction for sea otters) effect on these species. However, there are documented squid purse seine fishery interactions, of serious injury and mortality, with California sea lion and Pacific harbor seal stocks. But, the total fishery mortality and serious injury for the California sea lion stock is less than the PBR of 6,591 (Forney et al. 2000) (fishery mortality = 1,208, other sources of mortality = 144), and the majority of interactions occur in the gill net fishery rather than the squid purse seine fishery. Comparably, the total fishery mortality and serious injury for the Pacific harbor seal stock is less than the PBR of 1,678 (Forney et al. 2000) and the majority of interactions occurs in other fisheries (e.g., set gill net) rather than the squid fishery. Thus, we conclude that the effects of implementing the time(season)/area closure alternative is likely to have an adverse (incidental mortality or serious injury causes individuals to be removed from a marine mammal stock, but the level of take is below the PBR) but not significant effect on California sea lion and Pacific harbor seal stocks.

7.2.3.1.4.10.4 Harvest Replenishment Areas (Marine Protected Areas) Alternative

Areas declared harvest replenishment areas would prohibit the taking of market squid. These areas would serve to limit effort geographically and protect portions of the stock, and with the elimination of fishing pressure, spawning may proceed uninterrupted in harvest replenishment areas, providing both protection to market squid from overexploitation (providing fisheries enhancement) and space suitable for forage reserves. Implementation of the harvest replenishment areas alternative is not likely to increase squid fishery-marine mammal interaction rates as the overall fishing effort for squid vessels and light boats would be equal to or less than in the “no project” alternative. There would be no marine mammal interaction in closed areas, but exclusion of squid fishing in closed areas could shift fishing effort to areas with higher marine mammal populations (e.g., adjacent to pinniped rookeries, haul out sites, foraging areas). This could result in a higher rate of squid fishery interaction with marine mammals. However, this scenario can be avoided by ensuring that closed areas encompass important marine mammal foraging, breeding, and haul-out sites. A potential benefit to marine mammals may occur from an increased productivity of prey species available to marine mammals in the protected areas.

Given the past absence of squid purse seine fishery interactions, serious injury or mortality, with baleen whale stocks and the majority of the toothed whales, we assume that implementation of the harvest replenishment areas alternative would have an insignificant (no incidental mortality or serious injury) effect on these species. However, there are documented incidents of squid purse seine fishery interactions with short-finned pilot whales, Risso’s dolphins, and offshore bottlenose dolphins, thus there is the potential for these species to interact with the squid fishery. However, since short-finned pilot whales are no longer

common in the areas utilized by the squid purse seine fishery, and there are no recent accounts of interactions with Risso's dolphins or offshore bottlenose dolphins, we conclude that the effects of implementing the harvest replenishment areas alternative is likely to have an adverse (incidental mortality or serious injury causes individuals to be removed from a marine mammal stock, but the level of take is below the PBR) but not significant effect on short-finned pilot whales, Risso's dolphins, and offshore bottlenose dolphins.

There are no reports of squid purse seine fishery interactions, serious injury or mortality, with the northern elephant seal, Guadalupe fur seal, northern fur seal, or Steller sea lion stocks, and no reports of squid purse seine interactions with the southern sea otter. Thus, we assume that implementation of the harvest replenishment areas alternative would have an insignificant (no incidental mortality or serious injury for pinnipeds, and no interaction for sea otters) effect on these species. However, there are documented squid purse seine fishery interactions, of serious injury and mortality, with California sea lion and Pacific harbor seal stocks. But, the total fishery mortality and serious injury for the California sea lion stock is less than the PBR of 6,591 (Forney et al. 2000) (fishery mortality = 1,208, other sources of mortality = 144), and the majority of interactions occur in the gill net fishery rather than the squid purse seine fishery. Comparably, the total fishery mortality and serious injury for the Pacific harbor seal stock is less than the PBR of 1,678 (Forney et al. 2000) and the majority of interactions occurs in other fisheries (e.g., set gill net) rather than the squid fishery. Thus, we conclude that the effects of implementing the harvest replenishment areas alternative is likely to have an adverse (incidental mortality or serious injury causes individuals to be removed from a marine mammal stock, but the level of take is below the PBR) but not significant effect on California sea lion and Pacific harbor seal stocks.

7.2.3.1.4.10.5 Commercial Gear Restrictions Alternative

Implementation and modification of specific management measures regarding gear, such as definitions of legal gear, mesh size restrictions, gear marking, escape panels and ports, and the length of time gear may be left unattended, light wattage, light shields or other gear restrictions may be considered in this alternative. There are already existing wattage and shielding regulations enacted to mitigate potential light impacts on nesting seabirds and coastal communities. This alternative supports continued study and exploration in the use of alternative fishing methods, such as underwater lights, and urges the development of additional gear restrictions such as limitations on mesh or net size based on information collected in field studies, logbooks, or from bycatch or other information available from port sampling efforts. Future gear restrictions could include fishing without the aid of high wattage lights.

Implementation of the gear restrictions alternative is not likely to increase squid fishery-marine mammal interaction rates as the overall fishing effort for squid

vessels and light boats would be equal to or less than in the "no project" alternative. Fishing without the use of high wattage lights or underwater lights is not likely to substantially alter marine mammal behavior as marine mammals are likely attracted/repelled by the other elements involved in squid fishing activities (deck lights, engine noise, anchor deployment, generators, radios, human activity) in addition to the high wattage lights.

Given the past absence of squid purse seine fishery interactions, serious injury or mortality, with baleen whale stocks and the majority of the toothed whales, we assume that implementation of the gear restrictions alternative would have an insignificant (no incidental mortality or serious injury) effect on these species. However, there are documented incidents of squid purse seine fishery interactions with short-finned pilot whales, Risso's dolphins, and offshore bottlenose dolphins, thus there is the potential for these species to interact with the squid fishery. However, since short-finned pilot whales are no longer common in the areas utilized by the squid purse seine fishery, and there are no recent accounts of interactions with Risso's dolphins or offshore bottlenose dolphins, we conclude that the effects of implementing the gear restrictions alternative is likely to have an adverse (incidental mortality or serious injury causes individuals to be removed from a marine mammal stock, but the level of take is below the PBR) but not significant effect on short-finned pilot whales, Risso's dolphins, and offshore bottlenose dolphins.

There are no reports of squid purse seine fishery interactions, serious injury or mortality, with the northern elephant seal, Guadalupe fur seal, northern fur seal, or Steller sea lion stocks, and no reports of squid purse seine interactions with the southern sea otter. Thus, we assume that implementation of the gear restrictions alternative would have an insignificant (no incidental mortality or serious injury for pinnipeds, and no interaction for sea otters) effect on these species. However, there are documented squid purse seine fishery interactions, of serious injury and mortality, with California sea lion and Pacific harbor seal stocks. But, the total fishery mortality and serious injury for the California sea lion stock is less than the PBR of 6,591 (Forney et al. 2000) (fishery mortality = 1,208, other sources of mortality = 144), and the majority of interactions occur in the gill net fishery rather than the squid purse seine fishery. Comparably, the total fishery mortality and serious injury for the Pacific harbor seal stock is less than the PBR of 1,678 (Forney et al. 2000) and the majority of interactions occur in other fisheries (e.g., set gill net) rather than the squid fishery. Thus, we conclude that the effects of implementing the gear restrictions alternative is likely to have an adverse (incidental mortality or serious injury causes individuals to be removed from a marine mammal stock, but the level of take is below the PBR) but not significant effect on California sea lion and Pacific harbor seal stocks.

7.2.3.1.4.10.6 Other Management Options

There are other management options including, fee structure, monitoring program, vessel identification, regulation of bycatch, prohibited species, size limits, and coordination with the federal CPS plan, under consideration in the MSFMP. Implementation of these options does not directly affect or influence squid fishery interactions with marine mammals, thus, they are not addressed. It should be mentioned, however, that marine mammal interaction rates could be identified/verified with an on-board monitoring program. If the squid fishery is found to interact (serious injury or mortality) with a particular marine mammal stock at a greater rate than previously identified, the total fishery mortality and serious injury for that stock could be found to exceed its current PBR. This would list the stock as a "strategic stock" and subject the squid fishery to federal remedial actions, such as the establishment of a take reduction team.

7.2.3.1.5 Incidentally-taken Species

Through the Department's port sampling program, 1,481 samples were collected between October 1998 and September 2001 in California, with 422 observed landings containing incidentally-caught fish and invertebrates. This represents a 28% occurrence by frequency of bycatch (Table 7-14). Two or more species were observed as bycatch in 37% of landings with bycatch. Most of this bycatch was other coastal pelagic species, including Pacific sardine, Pacific mackerel, northern anchovy, and jack mackerel. Approximately two percent of sampled landings contained squid egg cases. Additionally, less than two percent of the landings contained species that are prohibited from being landed using seine gear (e.g., barracuda, yellowtail). The remaining species included mostly bottom fish and invertebrates.

Currently, the type of net used to fish for squid is unregulated, although purse seines used for squid typically do not hang as deep as purse seines used for other species, so contact with the bottom is reduced. Incidental catches of squid eggs and other species increase in the squid fishery when the nets are set in shallower water (less than 22 fathoms), where bottom contact may occur (Lutz and Linwood 2001). Damage to the substrate, and thus, mortality of squid eggs associated with purse seining for squid has not been quantified. The proposed project should have no significant impact on bycatch.

Table 7-14. List of observed market squid incidental catch (1998-2001)

Species	Percent frequency of occurrence
Pacific sardine	16.2
Pacific mackerel	7.0
Northern anchovy	4.5
Jack mackerel	2.8
Market squid eggs	1.8
Bat ray	1.4
California barracuda	1.4
Kelp	0.9

Table 7-14. List of observed market squid incidental catch (1998-2001)

Species	Percent frequency of occurrence
Pelagic red crab	0.8
Pacific butterfish	0.7
Horn shark	0.5
Sole	0.5
Colonial invertebrates	0.4
Sea star	0.3
Cabezon	0.3
Sea cucumbers	0.3
Ray	0.3
Smelt	0.3
Mexican pompano	0.2
Octopus	0.2
Rock crab	0.2
Sculpin	0.2
Blue shark	0.1
California halibut	0.1
Flyingfish	0.1
Bocaccio	0.1
California spiny lobster	0.1
Halibut	0.1
Jacksmelt	0.1
Mackerel unclassified	0.1
Pacific bonito	0.1
Pacific sole	0.1
Queenfish	0.1
Rockfish	0.1
Sanddab	0.1
Shrimp unclassified	0.1
Skate	0.1
Spider crab	0.1
Spotted sand bass	0.1
Wahoo	0.1
Yellowtail	0.1

7.2.3.1.6 Marine Turtles

7.2.3.6.1.1 Marine Turtles in California Waters

Four species of sea turtles are found in California waters: green, loggerhead, olive ridley, and leatherback. All four species are federally listed as either endangered or threatened (Table 7-15). Although no sea turtles have nesting grounds on California beaches, sighting (Stinson 1984) and stranding records indicate that the leatherback is the most common in California. A relatively high

level of leatherback sightings occurs in and around Monterey Bay (Starbird et al. 1993). The east Pacific green turtle is the second-most common sea turtle on the West Coast of the United States (Stinson 1984). A resident population of green turtles inhabits San Diego Bay, drawn to the warm-water effluent of the power plant. Loggerhead sightings in the eastern Pacific consist mainly of juveniles (Stinson 1984), are concentrated in southern California (Stinson 1984; Guess 1981a, b), and typically peak from July through September. Although olive ridleys are the most common sea turtle and have the widest range within the Eastern Pacific, they are rarely found off the California coast (Pitman 1990).

Table 7-15. Status* of marine turtles found in California state waters.

Scientific Name	Common Name	Status (Year of listing)
Chelonia mydas	Green	FE (1970), FT (1978)
Caretta caretta	Loggerhead	FT (1978)
Lepidochelys olivacea	Olive ridley	FT (1970)
Dermochelys coriacea	Leatherback	FE (1970)

*FE – Federally-listed endangered
FT – Federally-listed threatened

Based on interactions between turtles and fish harvesters occurring throughout the world, incidental catch poses a minor threat in habitats utilized by these species, including coastal feeding grounds and migratory corridors that exist along the western United States and Mexico. Based on historical interactions, rod-and-reel gear is not expected to result in turtle interactions. All other gear types have the potential to affect turtles, but would be highly unlikely to result in mortality. Studies of threats to sea turtles in other areas have revealed that the primary threats are incidental take in collisions with fishing boats. Various species of turtles are accidentally taken in several commercial and recreational fisheries including: bottom trawls commonly used by shrimp vessels in the Gulf of California, gill-nets, traps, pound nets, haul seines, and beach seines commonly used in inshore and coastal waters of Baja California. It is thought that trawls, tuna purse seines, hook-and-line, driftnets, bottom and surface longlines may kill additional numbers of turtles in different areas of the eastern Pacific. Pollution effects to turtles continue with the no project alternative.
Olive ridleys have occasionally been killed by gill-nets at current levels and boat impacts as well as cold stunning in Oregon and Washington. The one documented take of an olive ridley turtle in the driftnet fishery originated from eastern Pacific stock. From 1990 to 1997, an annual average of 96 olive ridley turtles were taken by the U.S. tuna purse seine fleet. Green turtles have been observed captured in nearshore gill-nets and longline gear. Loggerhead turtles have been documented “taken” in both longline and the drift gill-net fishery. Stranding data from 1990 to 1999 for California indicate an average of 2.1 loggerhead turtles strandings per year. Entanglement and ingestion of marine debris, including abandoned nets, continue to pose a threat to leatherbacks, which seem to have a talent for seeking out and getting tangled in floating lines.

7.2.3.1.6.2 Analysis of Impacts

The following significance criteria levels were used in the analysis to determine whether the proposed project could result in effects to marine turtles.

Impacts on endangered, rare or threatened species, or species otherwise protected by State or federal law, are significant if the project would result in danger of irreparable injury to, or mortality in, any population of any such species where such a change occurs at a rate that threatens the viability of the population; if the project would impair the recovery of any such species; or where the project has the potential to reduce the number or restrict the range of an endangered, rare, or threatened species as defined by Section 15380 of Title 14 of the California Code of Regulations; or where the project results in an adverse environmental impact on endangered, rare or threatened species, or species otherwise protected by State or federal law, that are individually limited, but cumulatively considerable. For purposes of these significance criteria, project-related impacts are cumulatively considerable when the incremental effect of the project is significant when compared the similar effects of past, present, and probable future projects.

There are no documented squid fishery interactions with any of the four species of sea turtles: these turtles are not known to prey upon market squid. Studies of threats to sea turtles in other areas have revealed that the primary threats are incidental take in collisions with fishing boats, thus there is the possibility that sea turtles could be hit by a market squid fishery boat. However, effects to sea turtles would be the same as currently exists. Displacement of fishing activities, due to designation of harvest replenishment areas, could increase the potential of interactions between sea turtles and fishing gear. Since the current interaction level is very low, it is not expected to significantly increase with the designation of harvest replenishment areas and would not exceed current levels. Therefore, effects to sea turtles from the proposed project are expected to be negligible.

7.2.3.1.7 Habitat Impacts

Market squid is a pelagic invertebrate (species capable of movement throughout the water column and/or just above the bottom) that uses nearshore sandy bottom habitat (benthos) to deposit egg cases. It is of commercial importance as well as prey for fish, seabirds, and marine mammals. Market squid are likely to be part of the deep scattering layer. The deep scattering layer is described as a layer of living organisms, ranging from almost microscopic zooplankton to copepods, shrimp, and squid. This layer is present at different depth ranges during the day (200 to 800 m) and night (generally near the surface).

7.2.3.1.7.1 Essential Fish Habitat (EFH)

The Pacific Fishery Management Council (PFMC) manages market squid under the Coastal Pelagics Fishery Management Plan. The Magnuson-Stevenson Act defines EFH as “those waters and substrate necessary to fish for spawning,

breeding, feeding, or growth to maturity." National Marine Fisheries Service guidelines state "adverse effects from fishing may include physical, chemical, or biological alterations of the substrate, and loss of, or injury to, benthic organisms, prey species and their habitat, and other components of the ecosystem." The EFH has been established for five species of coastal pelagics: Pacific sardine, Pacific mackerel, northern anchovy, jack mackerel, and market squid which is from the coast out to the edge of the EEZ between the U.S. to Canada and U.S. to Mexico borders.

Market squid are pelagic and widely distributed throughout the California current as adults and juveniles (Roper, et a., 1984), while paralarvae stay closer to shore (Zeidberg, et al. 2000). Spawning squid concentrate in dense schools and are the objective of the fishery. Recent remotely operated vehicle (ROV) surveys of spawning grounds show that egg cases are deposited in sandy semi-protected nearshore areas, usually between 60 and 180 feet (Kudroshoff, et al. 2000). However, egg cases have been taken in trawls at depths greater than 600 feet (R. Leos, pers. comm.). Egg cases occurred within a temperature range of 49.1º to 53.1º F. The exact conditions regulating spawning and spatial limits of egg deposition are unknown; thus, the precise habitat limitations for market squid spawning are unknown.

The effects of commercial squid fishing on habitat

7.2.3.1.7.2 Sanctuaries

Refuges, preserves, and marine sanctuaries are areas that are legally defined and regulated by the state or federal government, with the primary intent of protecting marine resources for their inherent biological or ecological value. Four national marine sanctuaries, out of 11 nationwide, are found in California, Cordell Banks (CBNMS, designated 1989), Gulf of the Farallones (FNMS, designated 1981), Monterey Bay (MBNMS, designated 1992), and Channel Islands (CINMS, designated 1980). Marine sanctuaries were created with the passage of the Marine Protection, Research, and Sanctuaries Act of 1972. The mission of the national marine sanctuary program is "to identify, designate and manage areas of the marine environment of special national significance due to their conservation, recreational, ecological, historical, research, educational, or esthetic qualities (15 CFR Part 922)." The objectives of the sanctuary program are to: 1) preserve and protect valuable marine resources, 2) promote scientific research, 3) enhance public awareness, and 4) facilitate, to the extent compatible with the primary goal of resource protection, multiple use of these marine areas. Two of the four sanctuaries, the Channel Islands National Marine Sanctuary and the Monterey Bay National Marine Sanctuary are targeted by squid fishermen (Fig. 7.1). Market squid are harvested at all four sanctuaries. During the last ten years, market squid harvested from the CINMS ranged from a low of 529 tons (1997-1998, includes El Niño period) to a high of 88,366 tons (1999-2000, La Niña period).

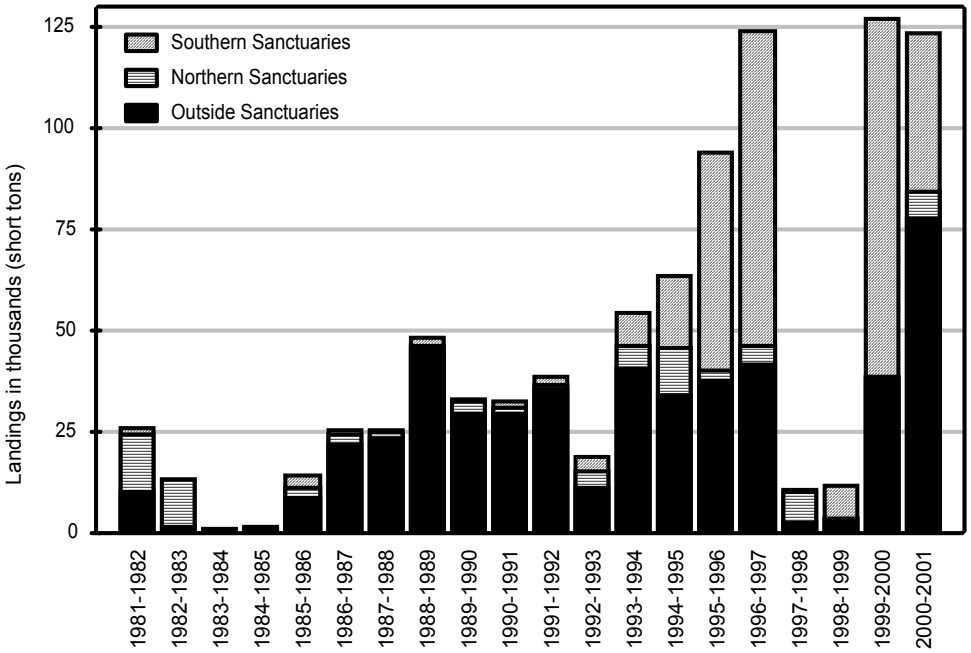

Figure 7-1. Total market squid landings by area landed: 1) CINMS, 2) MBNMS, FNMS and CBNMS and 3) outside of California National Marine Sanctuaries.

7.2.3.1.8 Effects of Consumptive Use on Environment

Currently, the type of net used to fish for squid is unregulated, although purse seines used for squid typically do not hang as deep as purse seines used for other species, so contact with the bottom is reduced. Incidental catches of squid eggs cases increase in the squid fishery when the nets are set in shallower water (less than 22 fathoms), where bottom contact may occur (Lutz and Linwood 2001) or when larger nets are used. Another issue is the bottom line on the net. The bottom line used to be restricted to one inch cable, but the larger nets use heavier chains or cables that are secured with huge shackles (J. Butler, pers. comm.). Damage to the substrate, and thus, mortality of squid eggs associated with purse seining for squid has not been quantified.

The growth of the southern California fishery coincided with complaints from coastal communities about the intensity of the squid vessel lights. From 1992 through 2000, the Newport Beach police received about eight to 10 calls, the latest call approximately two years ago regarding lights glowing through residents' windows. The Los Angeles County Sheriff dispatcher used to receive 15 to 20 calls weekly when squid boats were fishing in the area. Complaints are chiefly from the residents of Malibu, complaining of lights shining into their homes.

Since shielding and wattage restrictions were put in place (May 2000), the City of Monterey, Malibu City, the Channel Islands Coast Guard, the Malibu/Lost Hills Sheriff Department have not received any complaints about squid light vessels. Only the Laguna Beach police department received calls about the number of vessels off their coast, but the objective of these calls was to verify that an invasion was not occurring after the September 11th World Trade Center attack. The interim regulation regarding wattage and shielding appears to have alleviated the concerns of the coastal communities.

Fishermen engaged in the take of market squid may dispose of trash and other items while fishing. Evidence suggests that marine vessel and fishing activity are a primary source of anthropogenic debris in the Southern California Bight (Moore 1998). Net loss is minimal in seine fisheries. A limited entry fishery may reduce the number of fishers and vessels which should, in turn, reduce anthropogenic debris.

7.2.3.1.9 Effects of Nonconsumptive Use on Environment

Nonconsumptive users, such as underwater photographers and animal watchers, can have an impact on the environment. Divers entering the water from shore may trample organisms, disrupt spawning aggregations, or become entangled in kelp, causing temporary damage to kelp beds. Southern California intertidal populations susceptible to trampling include fleshy seaweeds, coralline algae, fragile tube-forming polychaetes, bivalves such as mussels, acorn barnacles, limpets, and grapsid crabs that seek refuge under loose rocks and seaweeds during low tide (Ghazanshahi 1983; Murray 1998).

In addition, nonconsumptive users may also dispose of trash in the marine environment, contributing to the problem of anthropogenic debris. Marine debris such as plastics and styrofoam can cause death or injury to animals in the marine environment when ingested or becoming entangled around an animal (NOAA 1998). No change from status quo to the environment by nonconsumptive use is expected.